

Serial No: 10/692,938  
Examiner: H. Trinh  
Title: SEMICONDUCTOR DEVICE AND METHOD FOR MANUFACTURING THE SAME

### **REMARKS/ARGUMENTS**

Reconsideration is requested in view of the following remarks. Claims 15-35 have been canceled. Claims 1-14 remain pending in this application.

The specification has been editorially revised on lines 12 and 22 of page 6 to retain consistency with the specification at line 30 on page 5.

### **Claim Objections**

Claim 2 is objected to because of informalities. Claim 2 has been canceled rendering this objection moot.

Claim 4 is objected to as being vague and ambiguous. Claim 4 has been editorially revised.

### **Claim Rejections – 35 USC §103**

Claims 1-14 are rejected under 35 U.S.C. §103(a) as unpatentable over Ohuchi (US 6,590,287) in view of Yamaguchi et al. (US 6,930,388). Applicants respectfully traverse this rejection.

The rejection incorrectly asserts the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. The specification clearly discloses that even if the electrode part and the electrode-part-connection electrode are connected directly by a metal joint, rather than a bump, the wiring substrate including the insulation layer with an elastic modulus of not less than 0.1 GPa and not more than 5 GPa enables the reduction of stresses occurring due to the thermal expansion difference between the semiconductor element and the wiring substrate. Connection reliability between the electrode part and the electrode-part-connection electrode can therefore be maintained (see e.g. lines 4-10 on page 15).

Further, since the semiconductor device has a structure such that the electrode part and the electrode-part-connection electrode are bonded directly without a bump, the

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reduction of the thickness and the cost of the device can be achieved (see page 5, lines 14-26 of the specification). The connection by a metal joint is defined on line 27 of page 5 to line 29 of page 6 of the specification.

Yet further, in the claimed semiconductor device of the present invention, the semiconductor element includes a plurality of the electrode parts, and a surface of the wiring substrate on a semiconductor element side and a surface of the semiconductor element on a wiring substrate side are bonded directly with each other so that spaces between the electrode parts are filled with the insulation layer. In other words, the semiconductor element and the wiring substrate are in close contact with each other as shown for example, in Figure 1. With this configuration, stresses occurring due to a thermal expansion difference between the semiconductor element and the wiring substrate can be reduced more effectively, and a thinner semiconductor device can be provided (see line 30 on page 6 to line 1 on page 7 of the specification).

As required by claim 1, setting the elastic modulus of the insulation layer composing the wiring substrate to not less than 0.1 GPa and not more than 5 GPa, bringing the semiconductor element and the wiring substrate in close contact with each other, and connecting the electrode part and the electrode-part-connection electrode by a metal joint so as to make the configuration bumpless, a small in size, thin, and reliable semiconductor device can be provided at a low cost.

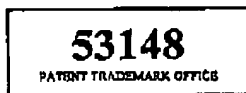
Ohuchi only discloses, as shown in Fig. 1a, the substrate electrode (pad 7) of the substrate 1 and the pad 8 of the semiconductor device 6 (corresponding to the semiconductor element of claim 1) are connected via the bumps 5 and the solder 2. A space between the semiconductor device 6 and the substrate 1 is filled with a first resin 3 (thermoplastic resin having a flux action) and a second resin (for instance, underfill resin). The packaging structure disclosed by Ohuchi therefore has a configuration completely different from that of the present invention in which the semiconductor element and the wiring substrate are in close contact with each other; and accordingly, such a thin configuration as that of claim 1 cannot be achieved.

The rejection incorrectly asserts that it would have been easy to achieve the present invention from the combination of the invention of Ohuchi and the stress

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reducing layer (elastic modulus: 0.1 GPa to 10 GPa) disclosed by Yamaguchi et al. The packaging structure disclosed by Ohuchi has a configuration completely different from that of the present invention. Accordingly, there is no reason to combine Ohuchi with Yamaguchi et al; and even with the foregoing combination, it is impossible to arrive at the invention of claim 1. Since there is no reason to combine Ohuchi with Yamaguchi et al., Yamaguchi et al. does not remedy the deficiencies of Ohuchi discussed above. For at least these reasons, claim 1 is patentable over Ohuchi alone or in combination with Yamaguchi et al.

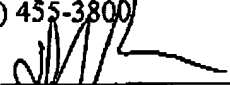
Favorable reconsideration in the form of a Notice of Allowance is requested. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.



Dated: Nov. 16, 2005

Respectfully submitted,

HAMRE, SCHUMANN, MUELLER &  
LARSON, P.C.  
P.O. Box 2902-0902  
Minneapolis, MN 55402-0903  
(612) 455-3800

By:   
Douglas P. Mueller  
Reg. No. 30,300  
DPM/dnh